

### ■ EXAMPLE 2.8

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sida 51.

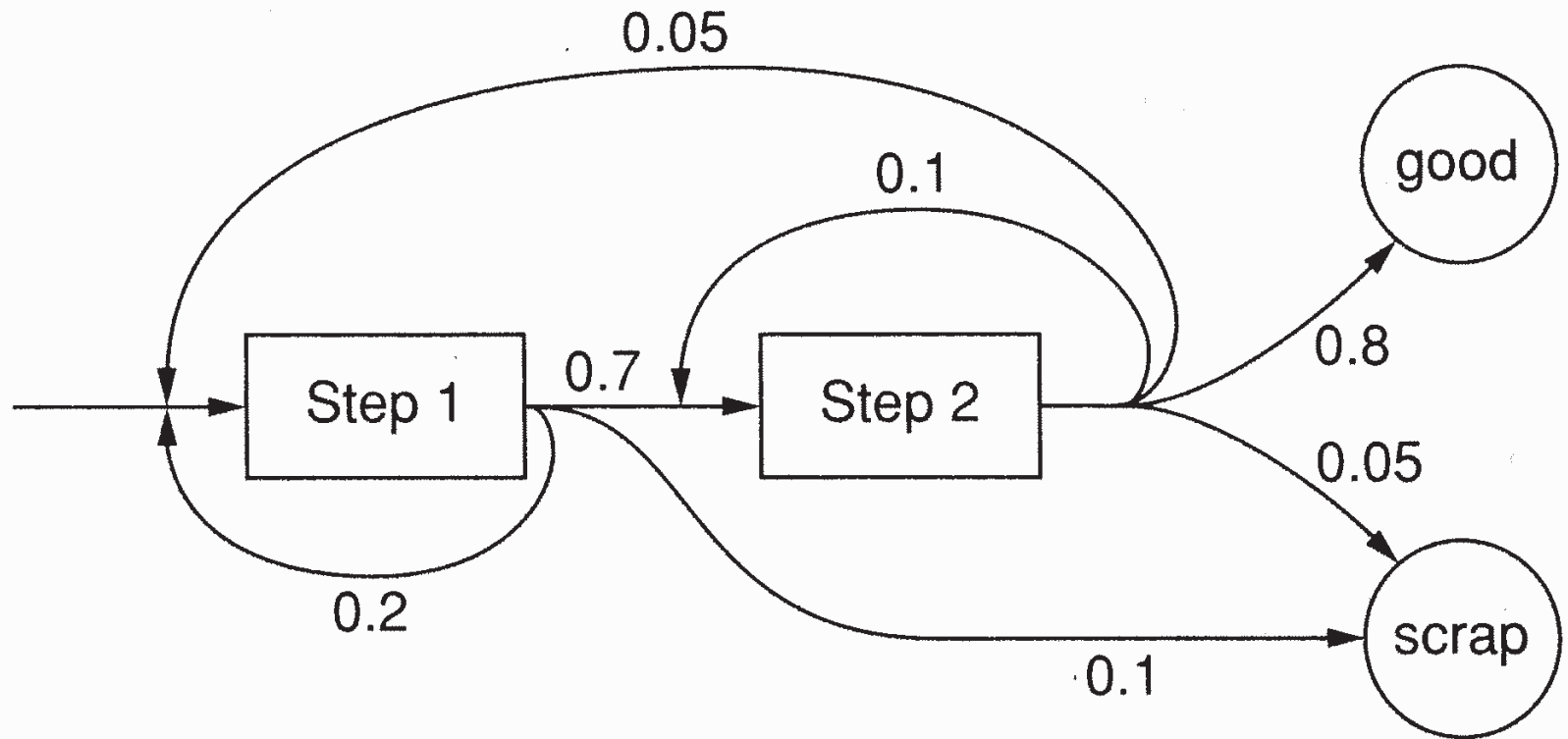
Beräkna sannolikheterna  
för, och förväntad tid  
till absorption, givet  
start i tillstånd 1.

A manufacturing process consists of two processing steps in sequence. After step 1, 20% of the parts must be reworked, 10% of the parts are scrapped, and 70% proceed to the next step. After step 2, 5% of the parts must be returned to the first step, 10% must be reworked, and 5% are scrapped; the remainder are sold. The diagram of Figure 2.7 illustrates the dynamics of the manufacturing process.

The Markov matrix associated with this manufacturing process is given by

$$P = \begin{matrix} 1 \\ 2 \\ s \\ g \end{matrix} \begin{bmatrix} 0.2 & 0.7 & 0.1 & 0.0 \\ 0.05 & 0.1 & 0.05 & 0.8 \\ 0.0 & 0.0 & 1.0 & 0.0 \\ 0.0 & 0.0 & 0.0 & 1.0 \end{bmatrix}. \quad (2.6)$$

Consider the dynamics of the chain. A part to be manufactured will begin the process by entering state 1. After possibly cycling for awhile, the part will end the process by entering either the  $g$  state or the  $s$  state. Therefore, states 1 and 2 are transient, and states  $g$  and  $s$  are recurrent. ■



**FIGURE 2.7** Two-step manufacturing process of Example 2.8.